A Collins HF-80 Military Style Ham Station

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I was inspired by the Johnson Desk Kilowatt to build a modern SSB version using Collins HF-80 components now beginning to appear on the military surplus market. The first picture shows the rig as completed with a KWM-380 that I upgraded with parts from Surplus Sales of Nebraska to become an HF-380. I was encouraged by the look and utility of this station, and a pile of HF-80 four channel ISB components, also to build a military style station, but for ham use, in a military 59" HF-80 cabinet. The second picture shows the components stacked on a piano dolly ready to go into the freshly stripped cabinet alongside them. While the cabinet was empty I built a mobile base for it from cedar 2x4 stock and used four heavy-duty casters. Metal bases and casters are also available from Winstead and other rack cabinet manufacturers. This raises the cabinet four inches total (including the three-eights-inch relief for the caster wheels) and makes it easy to move about. In military communications huts these things are bolted to the floor.

The Collins HF-80 Series

The Collins HF-80 series was developed in the early to mid-1980s for military HF communication applications and comprises quite an array of components, among which the following are those most interesting to ham operators:

8020/8030	**1-KW tube linear amplifier/power supply (single-phase 240VAC)**
8023/8031	**1-KW solid-state linear amplifier/power supply (single-phase 240VAC)**
8023/8032	**1-KW solid-state linear amplifier/power supply (three-phase 240VAC)**
8021	**3-KW tube linear amplifier (three-phase 240VAC)**
8022	**1-5/10-KW tube linear amplifier (three-phase 240VAC)**
8010/8050	**Exciter/receiver combination (two channel)**
8070/70A	**Transceiver (two channel)**
8014/8054	**Exciter/receiver combination (four channel)**
8040	**1-KW automatic antenna tuner (for whip or long wire)**

A complete list of HF-80 components is given on this site for further reference. Additional versions of these exciters, receivers and the transceiver with A model designation indicate that they may be remotely controlled in groups of up to 16 units. This is done by a similar appearing remote control unit which has an added 1-to-16 thumbwheel on its front panel to indicate the unit currently under control. The two channel units are traditional USB/LSB with ISB capability (plus AM and CW), but the four channel units also allow four 2.85 kHz channels to operate simultaneously: upper-upper sideband, USB, LSB, and lower-lower sideband. Not only can any mix of traffic (voice, teletype, etc.) be presented to a four channel exciter, it will automatically divide the power available from the amplifier it is exciting/controlling over the channels in use in a uniform way. The HF-8014A and 8054A units are widely available and in current ham use but we have little use for their concurrent four channel and power splitting capability, or for any of the ancillary units such as remotes, line flatteners (band-pass filters), pre-selectors, programmable communications controllers, encryption devices, etc.

Of considerably more interest to hams are accessories like the HF-2050 and 851S-1, Collins military receivers that actually have tuning knobs on them! All other HF-80 equipment is frequency-controlled by thumbwheels in order to reduce the front panel noise that is associated with optical disk tuning mechanisms. In addition, a ham could also buy a surplus HF-8096 communication controller to tune the band calling CQ until it found a contact for him. The Defense Department seeks to eliminate the need for skilled military radio operators by automatic link establishment technology (ALE) but we hams think that actually operating the radio is our personal value-add and a lot of fun as well. The two knob-based receivers are definitely recommended for use on the ham bands but are also a bit harder to find because they are in great demand by really serious SWLs as well, as is, of course, the British Aerospace Plessey shown in Picture 1. This receiver is a place-holder until I find a Collins 851S1 which matches the HF-80 units. I hope to trade the Plessey for an 851S-1; although the 2282A is a later design and actually a better receiver, it doesn't match. It is hoped that as HF-2050s are released by the Canadian military and the many 851S-1s made by Collins over the past 15 years hit the surplus market, prices will drop to more reasonable levels than they are today.

A Ham Radio Version of the Military HF-80

The current version of the military HF-80 employs two 8023 linear amplifiers, two 8031 (1PH) or 8032 (3PH) power supplies, and two 8061 line flatteners in one cabinet, and two 8014A and two 8045A units in another, along with ancillary units like 8064B preselectors. The 8032 three-phase power supply is a bit more common, often less expensive, and no harder to use. It can easily be wired for single-phase 240VAC operation or the purist can build a small rotary converter from an old 5-HP, 3-PH motor for 50 or 60 dollars.

An antenna tuner is often advisable when using a solid-state amplifier like the 8023, because it is designed to start reducing power when the VSWR rises above 1.3:1. One could use the HF-8040 antenna tuner for this application, or even the 8061 line flattener if one had a military antenna like a whip or long wire. This rack has the 8061 line flattener installed just above the 8023 amplifier and below the rack table in the third picture. The 8040 automatic antenna tuner is shown standing beside the cabinet in the picture. Naturally, this unit goes outdoors connected to the traditional military antenna, a 30' whip. Hams may prefer a long wire but it doesn't actually need to be very long. If the 8023 looks into exactly fifty ohms you don't need an antenna tuner at all. The original HF-80 amplifier, the HF-8020 1-KW unit employed a vacuum tube power output stage and handles up to 3:1 VSWR, so it is much more forgiving in this respect than the solid-state HF-8023.

The excitation requirements of modern military transmitters are rather different than those seen in amateur radio practice. All of the big surplus military linear amplifiers I have restored, like the Collins 204F-1, 204H-1, 208U-3, etc. required only 100-200 milli-watts of drive power. This is conveniently available from jack J5 of a Collins KWM-380 transceiver, and of course from any HF-80 exciter or transceiver.

Any ham lucky enough to land a pair of these cabinets with dual linear amps in one and dual exciter/receivers and their respective ancillaries in the other will likely split them into two identical rack mounted stations, then sell one and keep the other. The idea is to split the duplex units into the two such cabinets starting from the bottom: 8031/2 P/S--8023 Amp--8061 Line Flattener--work surface or pull out rack table--8054A Receiver--8014A Exciter--8064 Pre-selector (if desired)--external 8040 Antenna Tuner (if needed). Such a station, shown in Picture three has an even smaller footprint than the desk kilowatt and looks even more professional. David Ross, N7EPI has such a station and reports that it is a Cadillac radio. Which reminds me that in 1953 the Collins KW-1 cost almost exactly the same as a new Cadillac motorcar. The investment in this HF-80 Collins military style kilowatt is much less than a new Cadillac and about one-third to one-half the cost of a used KW-1. The last KW-1 that I restored, I sold for $15,000 in 1995 and it's probably worth more than $20k now.

The HF-8060 or 8064B pre-selectors are widely available and can be used in a sort of duplex mode with either an HF-80 exciter/receiver combo or the 8070 transceiver. The automatically tuned pre-selector filters out strong unwanted signals to the receiver and also removes spurious noise from the exciter output. These are moderately useful for ham radio practice, but the pre-selectors and the line flattener are designed primarily for use in communications environments having multiple high-powered transmitters and multiple receivers working in the same physical area. Hmm, maybe hams could use this stuff for multi-station contesting, after all. In fact, many of the design features that make military receivers so expensive (other than MIL-Spec) are put there to handle high-power signals from geographically and spectrally close-by transmitters. It is normal in ham practice to turn off the transmitter when listening to the receiver, so we don't need most of those features. For example, an HF-80 pre-selector connected to an HF-80 receiver will

disconnect the antenna if the RF voltage on the antenna terminals rises above 200 volts!

The Parts List

The parts list for the military style HF-80 kilowatt ham station shown here includes:

8023	**Amp**	**$3000 (new) Used from $1500 to 2200**
8031	**P/S**	**3000 (new) Used from $700 (3PH) to $2200 (1PH)**
HF-80	**Cable kit**	**1500 (new) Used or repaired from $200**
8014A	**Exciter**	**1500 (used)**
8054A	**Receiver**	**1500 (used)**
8061	**Line Flattener**	**1600 (new)**
8064B	**Preselector**	**700 (used)**
HF-80	**Cabinet**	**800 (used) Get one with slides, cables and retractors**
Winstead	**Rack Table**	**200 (new)**
8040A	**Antenna Tuner**	**1200 (new)**
Total		**$14,000**

The way used HF-80 units are coming onto the market, the reader may be able to duplicate this rig with all used or refurbished components for less than $8000. The real trick, of course, would be to find a complete pair of racks, right out of the military communications hut, before the junkers and strippers got to them, have a mover haul them to your shop and them separate them into two identical military style ham stations. That way you will have all the cables, connectors, ancillaries, etc. You will have a lot of cabling left over as well; that is, all of the cables used to connect the two cabinets at the top. Selling the spare system to a fellow Collins collector will reduce the cost of ownership for both of you.

Sources and Resources

The Winstead rack desk is available from **http://www.winstead.com/** but there are other suppliers as well.

Sources for HF-80 components include Paul Keys W6QDK at
http://www.columbiaelectronics.com
Mike Murphy at **http://www.maxpages.com/murphyjunk/**
Toronto Surplus at **http://www.torontosurplus.com/**

Occasionally HF-80 units, parts, and odd and ends of cables/connectors appear on Ebay, as well: **http://www.ebay.com/**

A nice URL with nice descriptions of Collins HF-80 Series equipment is located on Paul Keys site:
http://www.columbiaelectronics.com/rockwell_collins_hf_80_radio_system_data.htm

David Ross, N7EPI has some HF-8023 solid-state amplifiers new-in-the-box at very reasonable prices; he can be reached at **ross@hypertools.com**

You will have to find a matching power supply elsewhere. Toronto Surplus had one or more for sale recently for $675US. Toronto Surplus also has a stock of Collins HF-2050 DSP receivers. **http://www.torontosurplus.com/**

Collins KWM-380 and HF-380 parts, and the proper HF-80 cabinet slides are available from:
http://www.surplussales.com/

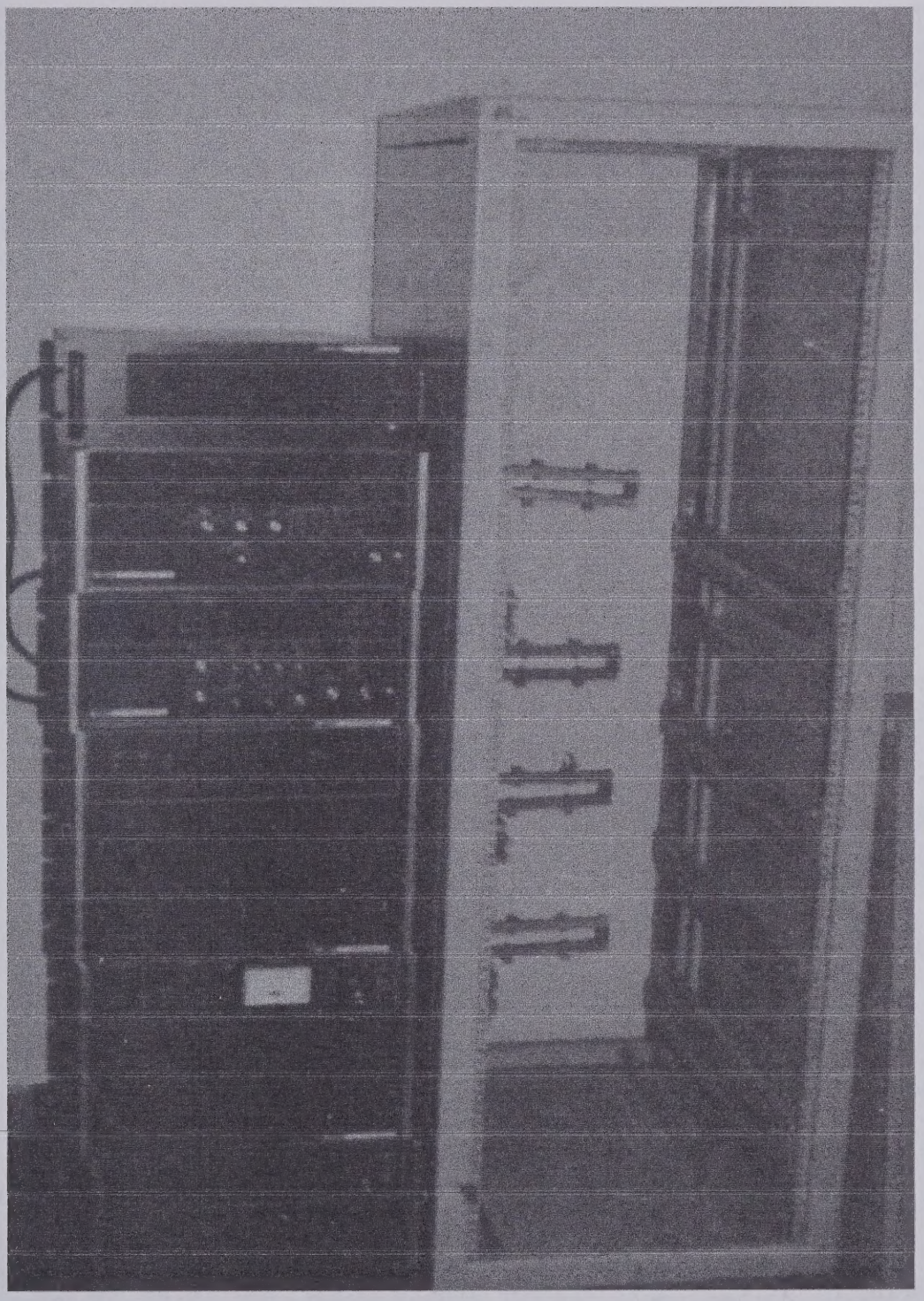
Surplus Plessey 2282A and Racal military receivers are available from Lee Craig at M&B Radio in Leeds, West Yorkshire, UK **info@mb-radio.co.uk**

If you would like to see the URG-III equipment that Collins is selling today as successor to the HF-80 Series, look at **http://www.collins.rockwell.com/gs/products/communications/**
To see pictures and specs of the actual units click on the URG-III item and get URL
http://www.collins.rockwell.com/content/pdf/1125.pdf
to download a .pdf (Acrobat Reader) file.

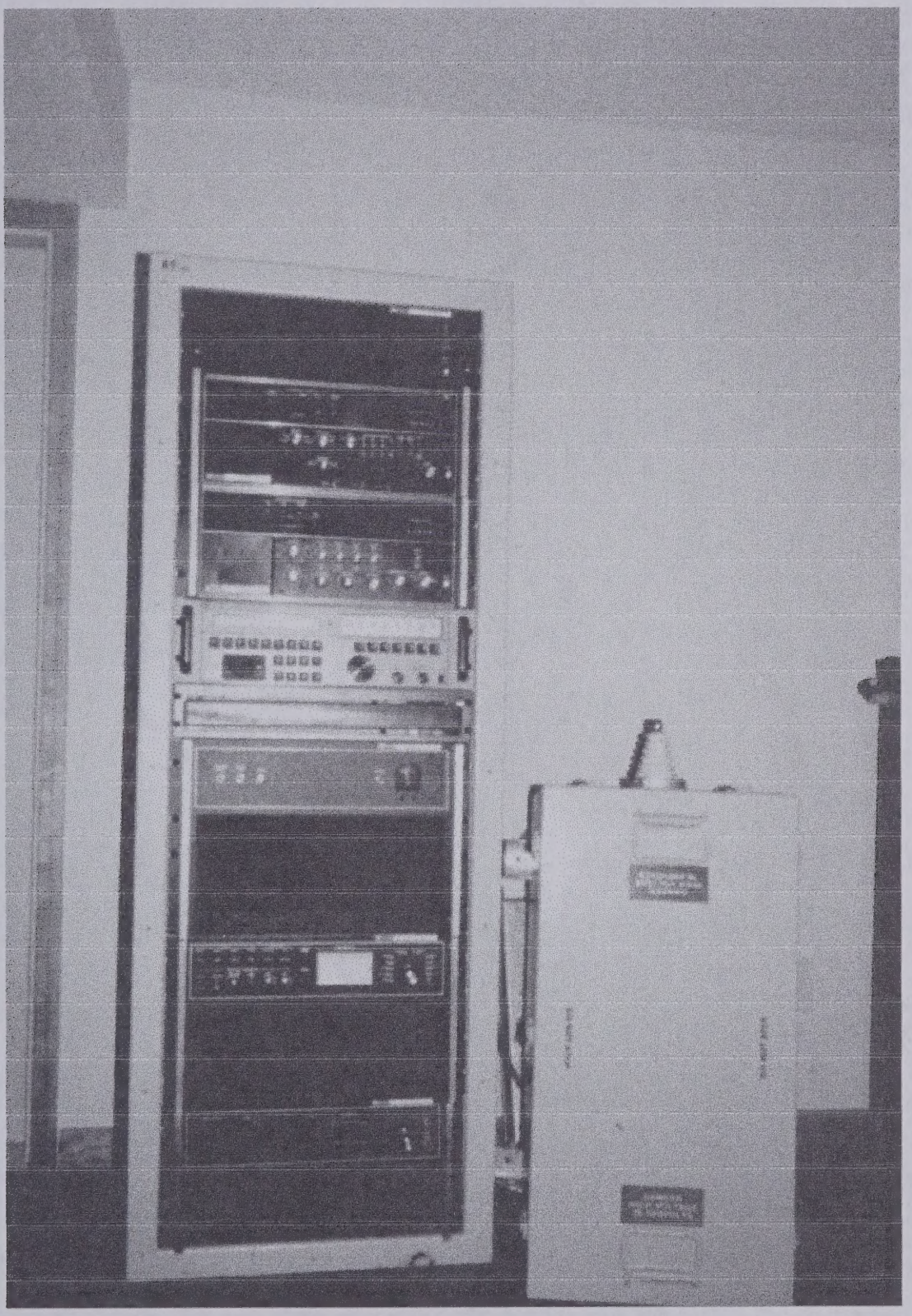
The whole HF-80 system has been resolved in the URG-III Series into many fewer modules having a great deal more operator automation (ALE). For example the currently produced RT-2200 Receiver-Exciter combination looks like a black, rack mounted Kachina. It is controlled by an industry standard architecture personal computer, or so says the Collins product literature. The new amplifier is a black 4KW unit similar in shape and size to the old Collins 208U-3, or about the size of a small refrigerator, or two five drawer file cabinets standing together.

For surplus military HF and VHF antennas in new or near new condition check with:
Scott Sidener, N0WFL at email address **scott@american-milspec.com**

Picture 1: The assembled Collins HF-80 desk kilowatt



Picture 2: A stack of HF-80 components



Picture 3: The completed HF-80 military style station and outdoor antenna tuner